a storm which began to develop over Arizona on the 24th and which had moved to southeastern Colorado by the morning of the 26th.

On the morning of the 10th a warning of a moderate cold wave was issued for eastern Colorado. On account of the unusual action of the LOW which failed to advance eastward as had been expected, the warning failed of verification.

A second warning of a moderate cold wave for eastern Colorado and eastern New Mexico, with stockmen's warnings for Colorado and northeastern New Mexico, was issued on the morning of the 26th. The warning was verified in the extreme eastern portion of Colorado, and a temperature of 20° occurred as far westward as Denver. The southward movement of the cold wave was retarded almost 24 hours, the final minimum temperature of 24° at Roswell occurring on the morning of the 28th.

Forecasts of probable minimum temperatures on the following morning were begun at El Paso, Tex., on the 1st, and owing to the advanced stage of fruit buds, at Roswell, N. Mex., on the 13th.

Warnings of freezing temperatures were issued for extreme southeastern New Mexico on the 8th and 9th, and of freezing temperatures or frosts in the fruit valleys of Colorado or southeastern New Mexico daily, beginning with the 19th. All of these predictions were verified by the occurrence of frost, or temperatures favorable for frost formation, except in southeastern New Mexico on the 24th and 25th. No frosts or freezing temperatures occurred in sections for which warnings were required that were not forecast.

On the morning of the 26th, after the receipt of a cold-wave warning from the district center, cautionary advices were issued by the official in charge, Roswell, N. Mex., stating that the probable minimum temperature during the night in that fruit district would be 30° to 34°. During the forenoon of the 27th, and before the receipt of the State forecast which contained a warning of a temperature near freezing at Roswell, and which had been delayed on account of the failure of the Roswell observation to arrive at the regular time, the same official issued advices warning against minimum temperatures on the morning of the 28th of 26° to 28° in the Pecos Valley fruit district, and of 23° to 25° in the improbable event of clearing weather during the evening. Warnings of temperatures of 25° to 27° were distributed by him to his substations at 8.40 p. m., when clearing weather became certain. The lowest temperatures in the Roswell fruit district on the morning of the 28th were from 22° to 24°. On the morning of the 28th, warnings of temperatures of 24° to 26° were issued to all orchardists in his fruit district by the official at Roswell. The actual minimum temperature at all reporting stations on the morning of the 29th was 26°.—*J. M. Sherier.*

SAN FRANCISCO DISTRICT.

There were no severe storms during the month. Conditions, however, became sufficiently threatening to warrant the ordering of storm warnings on 10 occasions for some one or more portions of the district, and small-craft warnings twice along the north and once along the south coast. Three storm warnings were only displayed for a few hours before being ordered down.

Frost warnings were issued for one or more localities on 13 days and they were practically all verified, although the frosts that formed were not heavy enough to do any great amount of harm.

During the first week of the month both the HIGHS and the LOWS moved east with unusual rapidity. On the 8th a large high-pressure area appeared over northern Alaska. It moved very slowly southeastward to the Canadian Northwest, and in doing so forced low-pressure areas entering the North Pacific coast southward. These low-pressure areas caused the heaviest rains of the month in California on the 12th and 13th, which was about four days after the high-pressure area first appeared over northern Alaska.

From the 14th to the end of the month there was a preponderance of high-pressure areas appearing over the Canadian Northwest or the North Pacific coast. Offshoots from these at sea frequently moved inland and joined forces with those moving southeastward from Alaska, with the result that only a few LOWS could be identified as having entered the United States from the Pacific Ocean. There were a few that apparently formed over the land between the two high areas, but they were poorly supplied with moisture and in consequence there was a general deficiency in rainfall in this district during the month.—*E. A. Beals.*

RIVERS AND FLOODS.

Floods during March, 1921.

ALFRED J. HENRY, Meteorologist.

[Weather Bureau, Washington, D. C., Apr. 30, 1921.]

The month was one of unusually high temperature, but fortunately for the flood situation, the accumulated snowfall of the winter was small in all parts of the country.

Precipitation was more or less frequent, but not heavy or long continued, save in a single instance, viz, over southwestern Mississippi and southeastern Louisiana, where the rainfall was remarkably heavy between the 9th and 14th. In Pike and Walthall Counties, Miss., a total of about 17 inches fell between these dates. The rainfall in other parts of the West Pearl River basin was much smaller, but nevertheless a stage of 18.6 feet, the highest of authentic record, was registered at Pearl River gaging station. Substantial money loss to highways, bridges, and railroads was sustained in the region above named.

Flood stages in the rivers of the upper and middle Mississippi drainage were rather frequent, particularly in three periods, viz, 9th–10th, 15th–16th, and 28th–31st. The floods of the last-named period were quite general throughout Ohio and Indiana, but not severe on any stream. Owing to the time of year, agricultural interests suffered but small loss.

It now seems that a severe spring flood in either the Ohio or the lower Mississippi is not probable.

The usual tables follow:

Estimated property loss from flood, March, 1921.

River district.	Tangible property, bridges, highways, etc.	Crops.		Live stock and other farm property.	Suspension of business.	Value of warnings.
		Gathered.	Prospective.			
Meridian, Miss.	$265,625		$41,750	$16,000	$35,460	$14,500
Little Rock, Ark.	2,000					
Fort Smith, Ark.			12,000			2,000
Indianapolis, Ind.	500		10,000			
Terre Haute, Ind.	1,200	$1,000	10,000		2,500	25,000
Cairo, Ill.						25,000

Floods during month of March, 1921.

River and station.	Flood stage.	Above flood stages—dates. From—	To—	Crest. Stage.	Date.
ATLANTIC DRAINAGE.					
Connecticut:	*Feet.*			*Feet.*	
White River Junction, Vt.	13	9	18	16.8	9
	13	21	(**)	16.7	22
Hartford, Conn.	16	11	19	19.9	12
	16	23	29	16.8	23,27,28
Mohawk:					
Utica, N. Y.	11	10	10	11.3	10
Sacandaga:					
Northville, N. Y.	14	10	10	14.0	10
Hoosic:					
Hoosic Falls, N. Y.	3	10	10	3.7	10
Cape Fear:					
Elizabethtown, N. C.	22	26	27	22.9	27
Santee:					
Ferguson, S. C.	12	(*)	14	13.0	1-3
	12	29	29	12.1	29
Rimini, S. C.	12	27	27	12.0	27
EAST GULF DRAINAGE.					
Tombigbee:					
Demopolis, Ala.	39	17	24	43.6	20
Pascagoula:					
Merrill, Miss.	20	16	20	21.8	17
Leaf:					
Hattiesburg, Miss.	19	13	17	20.9	15
Pearl:					
Jackson, Miss.	20	13	24	24.4	17
Columbia, Miss.	18	13	21	24.0	16
West Pearl:					
Pearl River, La.	13	(*)	3	13.1	1,2
	13	15	29	18.6	16
GREAT LAKES DRAINAGE.					
Maumee:					
Fort Wayne, Ind.	15	13	13	15.3	13
	15	28	(**)	16.8	29
Sandusky:					
Upper Sandusky, Ohio.	13	10	10	13.2	10
	13	29	29	14.2	29
St. Joseph:					
Montpelier, Ohio.	10	13	13	10.2	13
	10	28	29	11.2	28
MISSISSIPPI DRAINAGE.					
Ohio:					
Henderson, Ky.	33	13	15	34.0	15
Evansville, Ind.	35	13	17	36.4	14,15
Mount Vernon, Ind.	35	15	16	35.2	16
Shawneetown, Ill.	35	15	18	35.7	17
Muskingum:					
McConnelsville, Ohio.	22	29	30	22.2	29
Tuscarawas:					
Norris Point, Ohio.	8	7	11	10.1	9
	8	29	(**)	9.7	30
Coshocton, Ohio.	8	7	11	10.5	10
	8	29	(**)	12.7	29
Walhonding:	8	6	7	8.9	7
Walhonding, Ohio.	8	10	10	8.9	10
	8	28	30	12.6	29
Scioto:					
Larue, Ohio.	11	10	10	12.0	10
	11	28	30	13.0	29
Prospect, Ohio.	10	10	10	10.6	10
	10	29	30	11.9	30
Bellpoint, Ohio.	9	28	28	10.0	28
MISSISSIPPI DRAINAGE—continued.					
Scioto—Continued.	*Feet.*			*Feet.*	
Circleville, Ohio.	10	7	11	12.0	8
	10	29	(**)	15.8	29
Chillicothe, Ohio.	14	8	9	14.7	9
	14	29	(**)	20.8	30
Hentangy:					
Delaware, Ohio.	9	28	28	12.0	28
Stillwater:					
West Milton, Ohio.	10	28	28	10.5	28
Wabash:					
Terre Haute, Ind.	16	30	(**)	16.5	31
Bluffton, Ind.	12	30	30	12.1	29
Lafayette, Ind.	11	14	14	12.2	14
	11	28	(**)	18.7	29,30
Vincennes, Ind.	14	31	(**)	14.5	31
Mount Carmel, Ill.	15	15	15	15.0	15
	15	28	(**)	18.9	31
White (West Fork):					
Decker, Ind.	18	31	31	19.0	31
Anderson, Ind.	12	28	29	15.0	28
Noblesville, Ind.	14	29	30	15.1	29
Elliston, Ind.	19	27	(**)	25.8	31
Wisconsin:					
Knowlton, Wis.	12	21	22	14.8	21
Meramec:					
Steelville, Mo.	12	28	28	12.6	28
Pacific, Mo.	11	25	(**)	17.0	30
Valley Park, Mo.	14	28	(**)	18.8	31
Bourbeuse:					
Union, Mo.	10	29	30	13.6	30
Talahatchie:					
Swan Lake, Miss.	25	(*)	4	25.3	1,2
	25	16	(**)	27.5	25-29
Ouachita:					
Camden, Ark.	30	15	21	35.1	17
Arkansas:					
Fort Smith, Ark.	22	24	25	22.8	25
Dardanelle, Ark.	20	26	26	20.6	26
Neosho:					
Fort Gibson, Okla.	22	23	24	26.0	24
Petit Jean:					
Danville, Ark.	20	13	16	22.0	15
White:					
Calico Rock, Ark.	18	23	26	25.6	24
Batesville, Ark.	23	24	(**)	31.6	25
Newport, Ark.	26	26	(**)	28.8	27
Georgetown, Ark.	22	28	(**)	25.2	31
Black:					
Black Rock, Ark.	14	23	(**)	21.6	29
Cache:					
Patterson, Ark.	9	14	16	9.2	15,16
	9	25	(**)	9.4	29
Sulphur:					
Finley, Tex.	24	16	22	25.9	17
Ringo Crossing, Tex.	20	13	17	23.5	15,16
WEST GULF DRAINAGE.					
Trinity:					
Trinidad, Tex.	28	(*)	2	32.8	1
PACIFIC DRAINAGE.					
Sacramento:					
Knights Landing, Calif.	18	1	2	18.4	2
Willamette:					
Portland, Oreg.	15	19	20	15.1	20
Santiam:					
Jefferson, Oreg.	10	17	17	10.8	17

* Continued from February.

** Continued into April.

EFFECT OF WEATHER ON CROPS AND FARMING OPERATIONS—MARCH, 1921.

By J. WARREN SMITH, Meteorologist.

The outstanding features of the weather during March, 1921, in its relation to agricultural and horticultural operations where the unusual and persistently mild temperatures that prevailed until near the close of the month and the disastrous cold wave that overspread nearly all sections of the country during the last few days. The unusually warm weather in all central and southern sections of the country had prematurely developed fruit to a stage of approximately one month in advance of the average season. From the 26th to the 30th a severe freeze occurred over a large section of the country where most fruit trees were in full bloom. Freezing temperatures extended as far south as the northern portions of the Gulf States and to North Carolina in the Atlantic coast section. Heavy damage to, and in most sections a complete loss of, practically all early fruit and much of the later varieties was suffered over most of the central sections of the country.[1]

The weather during the month was generally favorable for farm work and corn planting made good progress in the Southern States; cotton planting had become general over the southern portion of the belt at the close of the month. Winter grains made rapid progress until the cold wave the latter part of the month and no widespread damage occurred from the freeze. Spring-wheat seeding progressed satisfactorily for the most part, but was retarded the latter part of the month by precipitation and cold weather. By the close of the month much

[1] A more detailed account will appear in the April REVIEW.